

# CHAPTER 2

## Motion in a Straight Line

### Distance, Displacement, Speed and Velocity

1. Preeti reached the metro station and found that the escalator was not working. She walked up the stationary escalator in time  $t_1$ . On other days, if she remains stationary on the moving escalator, then the escalator takes her up in time  $t_2$ . The time taken by her to walk up on the moving escalator will be: (2017-Delhi)

- a.  $\frac{t_1 t_2}{t_2 - t_1}$       b.  $\frac{t_1 t_2}{t_2 + t_1}$   
c.  $t_2 - t_1$       d.  $\frac{t_1 + t_2}{2}$

2. Two cars P and Q start from a point at the same time in a straight line and their positions are represented by  $X_p(t) = at + bt^2$  and  $X_Q(t) = ft - t^2$ . At what time do the cars have the same velocity? (2016 - II)

- a.  $\frac{a+f}{2(1+b)}$       b.  $\frac{f-a}{2(1+b)}$   
c.  $\frac{a-f}{1+b}$       d.  $\frac{a+f}{2(b-1)}$

3. If the velocity of a particle is  $v = At + Bt^2$ , where A and B are constants, then the distance travelled by it between 1 s and 2 s is: (2016 - I)

- a.  $\frac{3}{2}A + 4B$       b.  $3A + 7B$   
c.  $\frac{3}{2}A + \frac{7}{3}B$       d.  $\frac{A}{2} + \frac{B}{3}$

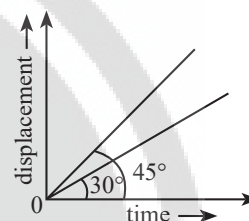
### Acceleration

4. A particle of unit mass undergoes one dimensional motion such that its velocity varies according to  $v(x) = \beta x^{-2n}$  where  $\beta$  and  $n$  are constants and  $x$  is the position of the particle. The acceleration of the particle as a function of  $x$ , is given by: (2015)

- a.  $-2n\beta^2 x^{-4n-1}$       b.  $-2\beta^2 x^{-2n+1}$   
c.  $-2n\beta^2 e^{-4n+1}$       d.  $-2n\beta^2 x^{-2n-1}$

### Graphs

5. The displacement time graphs of two moving particle make angles of  $30^\circ$  and  $45^\circ$  with the x-axis as shown in the figure. The ratio of their respective velocity is: (2022)



- a.  $1:\sqrt{3}$       b.  $\sqrt{3}:1$   
c.  $1:1$       d.  $1:2$

### Motion under Gravity

6. The ratio of the distance traveled by a freely falling body in the 1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup> and 4<sup>th</sup> second: (2022)

- a.  $1:1:1:1$       b.  $1:2:3:4$   
c.  $1:4:9:16$       d.  $1:3:5:7$

7. A ball is thrown vertically downward with a velocity of 20 m/s from the top of a tower. It hits the ground after some time with a velocity of 80 m/s. The height of the tower is : ( $g = 10 \text{ m/s}^2$ ) (2020)

- a. 340 m      b. 320 m  
c. 300 m      d. 360 m

8. A person sitting in the ground floor of a building notices through the window, of height 1.5 m, a ball dropped from the roof of the building crosses the window in 0.1 s. What is the velocity of the ball when it is at the topmost point of the window? ( $g = 10 \text{ m/s}^2$ ) (2020-Covid)

- a. 14.5 m/s      b. 4.5 m/s  
c. 20 m/s      d. 15.5 m/s

9. A stone falls freely under gravity. It covers distances  $h_1$ ,  $h_2$  and  $h_3$  in the first 5 seconds, the next 5 seconds and the next 5 seconds respectively. The relation between  $h_1$ ,  $h_2$  and  $h_3$  is: (2013)

- a.  $h_1 = h_2 = h_3$       b.  $h_1 = 2h_2 = 3h_3$   
c.  $h_1 = \frac{h_2}{3} = \frac{h_3}{5}$       d.  $h_2 = 3h_1$  and  $h_3 = 3h_2$

**Answer Key**

1	2	3	4	5	6	7	8	9
b	b	c	a	a	d	c	a	c

